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## GENERAL SPECIFICATIONS

OF WIRING FOR

# Electric Light in Buildings

BY

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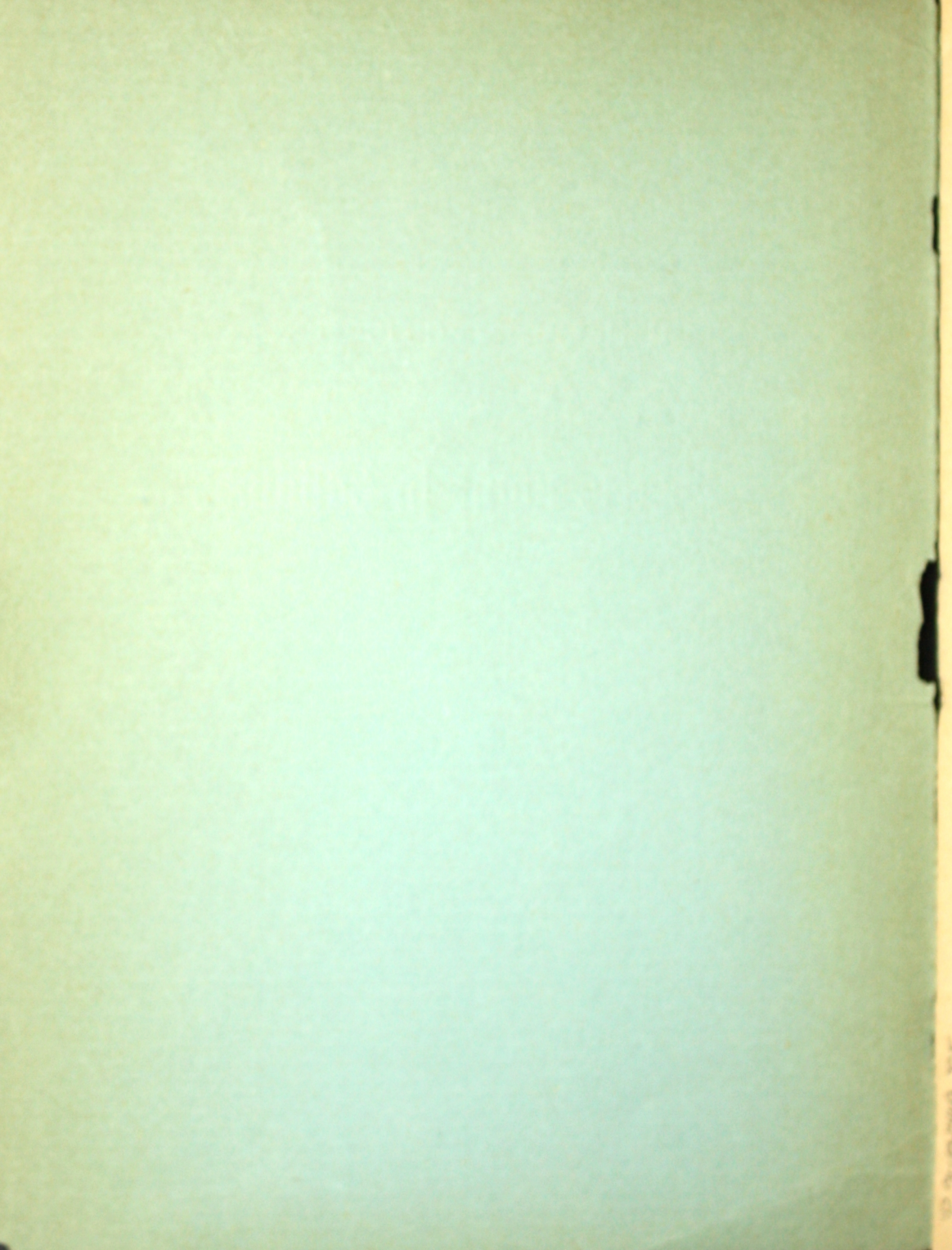
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# Specifications of First Class House-Wiring for Electric Light

BY

ROBERT A. CUMMINGS,  
*Assoc. M. Am. Soc. C. E., Ass't Engineer N. & W. R. R.*

## GENERAL CLAUSES AND CONDITIONS.

### SECTION I.

1. The work will be installed and completed under <sup>Superintend-</sup> ~~Superintendence~~ of the Engineer and to his satisfaction.
2. The Contractor must supply at his own expense all <sup>Labor, Tools, etc.</sup> experienced labor and workmanship, together with all tools and structures of every description, which may be necessary for the proper completion of the work.
3. The highest grade of materials to be used, unless <sup>Material.</sup> otherwise specified.
4. The Contractor must not interfere with other work <sup>Responsibility.</sup> without permission of Engineer, and all work must be properly guarded and protected to avoid accidents.
5. All work must comply with requirements of New York Board of Underwriters.

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- Diagram. 6. The Contractor must supply a diagram indicating the sizes of wiring, location of switches and fuse blocks, this diagram to be submitted to the Engineer for approval before work is let or proceeded with.
7. All wiring work and materials shall be satisfactory to the Engineer.
- Discrepancies. 8. The Contractor is to proceed with or suspend the work or any portion of it, as the Engineer may direct, and shall not vary from diagram furnished or specifications, except upon the written order of the Engineer, and all work or materials not meeting the requirements of the specifications must be corrected or removed at the expense of Contractor.
9. The specifications and diagram are intended to cover everything required for the proper execution of the work and any work or materials obviously a part of the work or contract, omitted from specifications and diagram, shall be done without extra charge by Contractor.
10. The Contractor must notify the Engineer should any discrepancy appear in the specifications.
- Finished work. 11. All finished work must be in perfect condition at completion of this contract.
- Alterations. 12. Any alterations, additions or deductions of work or materials specified and found necessary, shall be acceded to by the Contractor, will not in any way violate this contract, and cost of such charges shall be agreed upon before the work is executed, being added or deducted from the contract price according as the cost of the work has been increased or diminished.
- Extra work. 13. No extra work shall be paid for, unless ordered in writing, such order to state cost of extra work.
14. Contractor shall state in his proposals what allowance will be made for one-light outlets; should any be omitted, the same price to be accepted for one-light outlets if added or deducted to those shown in diagram.
- Annulment of Contract. 15. Should the Contractor become bankrupt, or otherwise unable to carry on the work, or neglect or refuse to



promote the work with such despatch as is thought proper by the Engineer, it shall be lawful for the Engineer to employ such other person, or persons as he may see fit to finish and complete the unfinished portions of the work, first notifying the Contractor of such intention in writing and the cost of such alterations or additions shall be deducted from any moneys due the Contractor.

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## EXECUTION OF THE WORK.

### SECTION II.

1. Wires must be run to center of distribution in basement or roof, and thence vertically to the various floors for further distribution. General Plan of Wiring.

2. At the point of main and branches supplying a floor, Junction Closets will be located locked junction boxes, or closets, with the main cut-outs and switches for that floor.

3. All junction closets must be neatly lined with asbestos.

4. Each cut-out and switch must be neatly marked with the name of the circuit they control. Cut-outs and Switches.

5. All switches and cut-outs are to be located at some convenient place and in plain sight.

6. It is not permissible to have more than six lights on one cut-out.

7. All side outlets must be six feet from floor. Side Outlets.

8. All circuits will be wired for one more light than Circuits. shown on diagram and each circuit to be controlled with separate switch and cut-out.

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## WIRING.

9. Wiring to be on the "Three Wire System," with neutral wire, equal in carrying capacity to the sum of the car-



rying capacity of the outside wires. No wires may be grounded.

10. Distribution of wiring to be such that the entire system of wiring can be changed at the main switch board to the "Two Wire System."

Carrying Capac-  
ity.

11. Carrying capacity of wiring to be calculated for "Two Wire System," and on basis of lamps requiring six-tenths of one ampère and 110 volts each.

Loss.

12. The drop in voltage must not exceed three volts between any two parts of the system, with all lamps lighted, and not to exceed one volt between any two lamps on one floor, with all lamps lighted.

13. No wire smaller than No. 16 B. and S. gauge is to be used.

Connecting with  
Fixtures.

14. At outlets, wiring is to be properly connected up with fixture wiring by Contractor.

15. Incombustible, double pole cut-outs must be located wherever size of wire changes, and at the point where the feeders enter the building.

Old Buildings.

16. Old buildings should be wired with surface work, or wiring concealed in approved tubing or mouldings, fastened with screws, and made detachable for inspection.

Joints and  
Soldering.

17. All joints in wiring must be soldered on clean surfaces, and pure rubber tape insulation must cover the joint neatly.

18. The soldering surfaces must be perfectly clean, and soldering salts used.

19. All heavy joints should be dipped and solder should flow between the wires and be carefully trimmed before wrapping.

20. As few joints as possible is permissible.

Carrying Capac-  
ity.

21. Carrying capacity of mains for the various floors must be based on the following table, showing the distribution and location of outlets:







best rubber and another silk, or both fire and water proof insulation must be used.

30. The flexible cables are to be submitted for approval of Engineer, before being used.

31. Flexible cables must be so suspended that the entire weight of the socket and lamps, or a sudden stress, will be borne by loop knots or adjustable balls in the cable.

Stranded Con-  
ductors. 32. Stranded conductors must be soldered together and insulated.

Cut-outs and  
Safety Plugs. 33. Porcelain base cut-outs, with porcelain covers or porcelain base plug cut-outs, are to be used throughout the work, and where exposed to explosive gases, must be enclosed in air tight cases.

Extra Fuses and  
Plugs. 34 Contractor will furnish safety fuses, plugs and supply 5 per cent. extra.

35. Cut-outs must be placed as near the switches as possible.

Moisture. 36. In places subject to moisture, conductors must be carried on glass or porcelain insulators.

Construction. 37. Double pole cut-outs must be so constructed that an arc cannot be maintained between the terminals by fusing of the safety fuse.

Proportion of  
Safety Fuses. 38. Safety fuses must be proportioned to the conductors they protect and must fuse before the maximum safe carrying capacity of the wire is exceeded.

Fuses to be  
marked. 39. All fuses must be marked with the number of amperes equal to safe carrying capacity of conductor they protect.

Safe Carrying  
Capacity of a  
Wire. 40. The safe carrying capacity of a wire changes under different circumstances, being about 40 per cent. less when enclosed in a tube or moulding, than when bare and exposed to the air, when the heat radiates rapidly.

Size of Fuse. 41. Size of fuse will depend upon size of smallest conductor, and not upon the current to be used.



42. The following table shows safe carrying capacity of conductors of different sizes which must be followed for all interior work:

BROWN & SHARPE.		BIRMINGHAM.		EDISON STANDARD.	
Gauge No.	Ampères.	Gauge No.	Ampères.	Gauge No.	Ampères.
0000	175	0000	175	200	175
000	145	000	150	180	160
00	120	00	130	140	135
0	100	0	110	110	110
1	95	1	95	90	95
2	70	2	85	80	85
3	60	3	75	65	75
4	50	4	65	55	65
5	45	5	60	50	60
6	35	6	50	40	50
7	30	7	45	30	40
8	24	8	35	25	35
10	20	10	30	20	30
12	15	12	20	12	20
14	10	14	15	8	15
16	5	16	10	5	10
		18	5	3	5

43. When a lamp is spoken of it is meant 16-candle power.

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### INSULATION.

44. Insulation of any circuit, or the whole system, with Testing. all switches and cut-outs, will be tested for grounds, crosses and insulation by a high resistance galvanometer, before current is put on, and must not be less than 250,000 ohms, testing to be at expense of Contractor.

45. Hard rubber tube must be used when two adjacent Extra insulation. conductors of same polarity and different circuits approach each other, or where a positive wire crosses close to a negative wire.



- Insulation. 46. Inflammable parafine insulation is not allowed under any circumstances.
- Acid Fumes. 47. Conductors exposed to acid fumes must have lead covered insulation.
- Flexible Cables. 48. Flexible cables must be protected by insulating bushings where cord enters the lamp socket.
- Wire. 49. The highest grade of fire and water proof covered wire must be used.  
50. Underwriter's wire bare or cotton covered and painted must not be used.
- Sharp bends. 51. Sharp bends are not permitted when insulation is liable to be injured.
- Cleat work. 52. All cleats used must be hard wood or porcelain, and spaced not more than three feet apart, separating conductors at least two and one-half inches, and fastened with screws.
- Metal Staples. 53. Metal staples must never be used under any circumstances.
- Concealed work. 54. New buildings must be wired before lathing is commenced.
- Interior Tubing. 55. Interior tubing or conduits must be incombustible and not injured by plaster, cement, or such material that will injure the insulation of the conductors, or of such construction that insulation of conductors will be destroyed; and must be so placed that conductors can be easily removed.
- Switches. 56. Switches must have porcelain bases, and placed in dry, accessible places.  
57. All switches must be double pole when more than six ampères are to pass through them.  
58. Switches must make and break current quickly.
- Carrying Capacity. 59. Switches must have a carrying capacity sufficient to prevent heating above the surrounding atmosphere, and will not be permitted in places with explosive gases or moisture, except when enclosed in air tight cases.
- Fixture Wiring. 60. All combination fixtures must be electrically separated from gas pipe or earth.



61. When wired outside conductors must be so secured as not to be cut or abraded by pressure of the fastenings on motion of fixture.

62. All conductors must be water proof, and not less Conductors. than No. 16 B. and S. gauge.

63. All burrs or sharp edges must be removed before conductors are placed in fixtures.

64. Upper end of fixture must be sealed to prevent con- Preventing con-  
densation. densation.

65. No combination fixture, within which the conductors are concealed in a space less than one-quarter inch between inside pipe and outside casing, will be permitted.

66. Small wires at end of each flexible cable must be Flexible Pend-  
ants. soldered together before making connections.

67. Twisted flexible cable must not be used for pendants Flexible Cables. in contact with inflammable material, or for wiring fixtures on the outside.

68. All sockets used for cable pendants must have Flexible Pend-  
ants. openings at least equal to one-quarter inch gas-pipe size.

69. Key sockets are not allowed for flexible pendants. Key Sockets.

70. Wall switches must control all flexible pendants.

71. Flexible pendants will not be allowed to have more than a four-light cluster, in which case, however, extra heavy wire will be required for strengthening.

72. Lamp sockets will not be allowed to come in elec- Insulation of  
Sockets. trical contact with outside objects, and where exposed to the weather, to be perfectly insulated to prevent short-circuiting.

73. Where electric gas lighting is used on same fixture Electric Gas  
Lighting. with electric light, no part of gas fixture or piping shall be in electrical connection with gas lighting circuit, and the two installations shall be electrically separated and free from grounds.



## ALTERNATING CURRENT SYSTEMS.

## Converters.

74. Converters must not be placed inside of any building, except when completely enclosed in a non-combustible casing, and by written permission of the Engineer.

75. Converters may not be attached to outside walls of buildings, unless electrically separated, and must be in a dry and convenient location, and approved by the Engineer.

76. All converters must have cut-outs at junction between main and service conductors, and in all secondary circuits where they will not be affected by heat of the conductor.

## Location.

77. In case it is not possible to exclude converters and primary conductors from the building, the converter must be located as near as possible to the point where the primary conductors enter the building.

## Extra Insulation.

78. And the conductors between the points must have extra moisture-proof insulation and be thoroughly protected from mechanical injury.

79. If the primary conductors are within a building, a double pole switch and automatic double pole cut-out must be provided.

## Switch.

80. Where the conductors enter the building, a switch must be encased on outside of building, and when possible in a locked fire-proof box.

## Primary Conductors.

81. Primary conductors must be kept at least ten inches apart.







